



# Interactive Visualization of Near Real Time and Production Global Precipitation Measurement (GPM) Mission Data Online Using CesiumJS

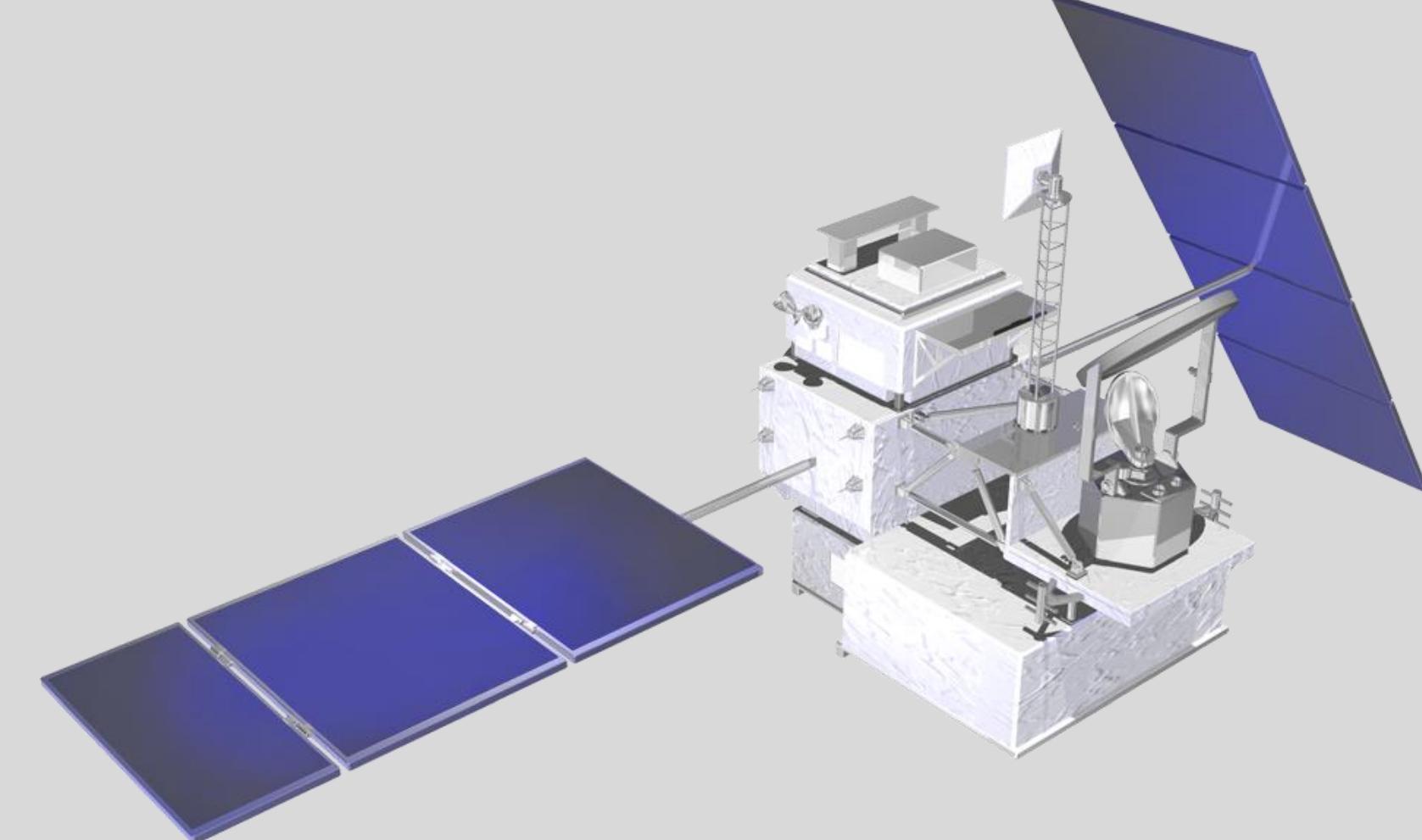
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## About PPS STORM and GPM

- The Precipitation Processing System (PPS) group at NASA Goddard processes, analyzes, and archives data for the Global Precipitation Measurement (GPM) mission.
- STORM (<https://storm.pps.eosdis.nasa.gov>) is a data order interface for GPM Core and Constellation satellite data, as well as TRMM archival data.
- The visualizations featured on this poster were developed for three reasons:
  - To enable viewing of Near Real Time (NRT) data.
  - To improve the ability of users to make decisions about what files they should acquire.
  - To provide a curated list of high-impact events visualized in 3D highlighting both instruments of the GPM platform.

## GPM Core Satellite



Two Primary Instruments:  
GPM Microwave Imager (GMI)  
Dual-frequency Precipitation Radar  
(DPR)

- Near Real Time data with latency of 30-120 minutes.
  - Integrated Multi-satellite Retrievals for GPM (IMERG) data used is “early” run, ~4 hours after the relevant time.
- Uses “Production” data, which is available 36-48 hours after the scan.
  - Data available from GPM core satellite, Tropical Rainfall Measurement Mission (TRMM) satellite, and 11 partner satellites.
  - IMERG data is from “production” run, which is released 4 months after the relevant date.

- Automated processing converts relevant HDF5 gridded binary data to CesiumJS Markup Language (CZML).

- Processing occurs at 5 minute intervals for GMI, 30 minute for DPR, 1 hour for IMERG.
- A rolling 24 hour window of data are available.

- A high-impact event scanned by the GPM core satellite is identified.

- NRT Level 2 files for DPR and GMI scans are acquired, combining the 5-minute GMI segments into one 30 minute file.

- Ideal coordinates for initial camera position are determined; a short write-up is generated describing the event and the scan.

- HDF5 values are converted to JSON in Java backend, which the website processes into points using Javascript.

- DPR data can be viewed colored by precipitation rate or altitude.

- Website makes request to a Java servlet, initiating server-side processing.

- Because files and website are on the same server, files can be directly accessed by the Java backend to acquire data values.

- Like with the Event Viewer, HDF5 values are converted to JSON in Java backend, which the website processes into points using Javascript.

- Precipitation rate values are available for six products from over a dozen satellites.

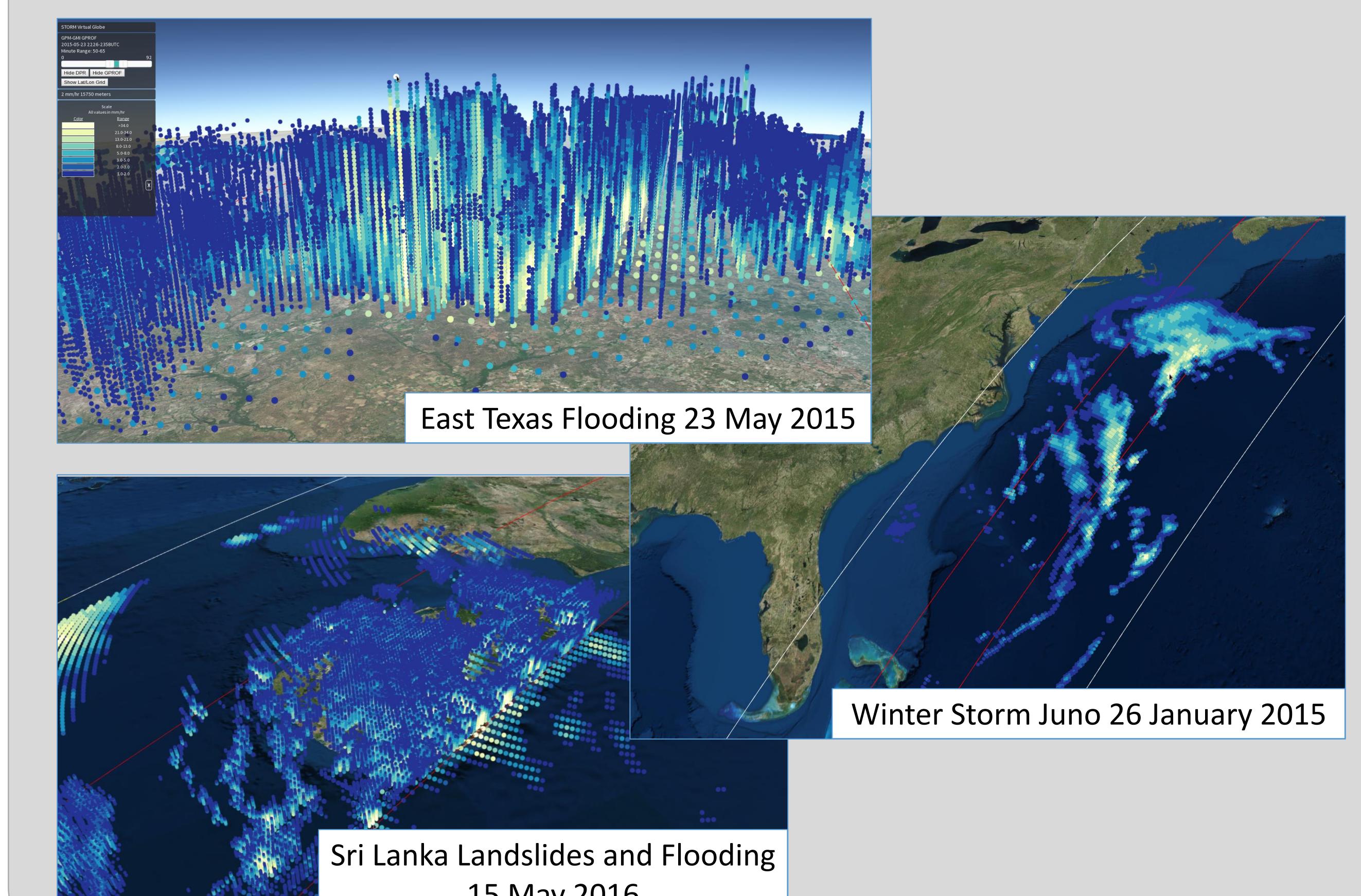
## About CesiumJS

- CesiumJS is an open-source Javascript library for visualizing information on a 3D globe in a WebGL-compatible browser.
- It is compatible with a variety of geospatial data formats but is best coupled with a JSON-based format called CZML. CZML is time-dynamic, which means anything that evolves with time (color, opacity, position, size) can have that change represented.



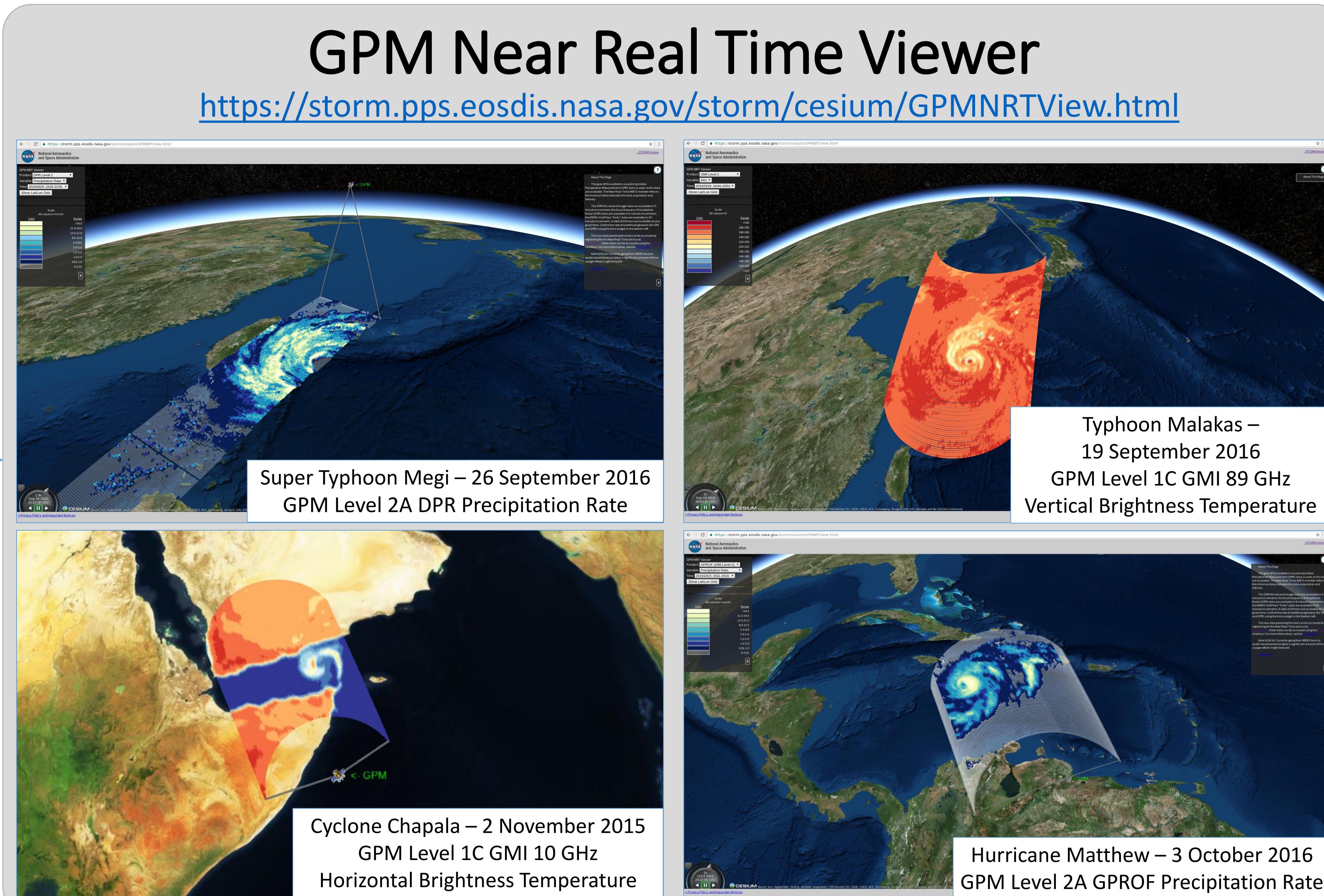
CesiumJS is used for many applications: aggregating earthquake survivor stories (left), replicating an entire town in 3D (middle), tracking Santa (right).

## Not Just Tropical Systems



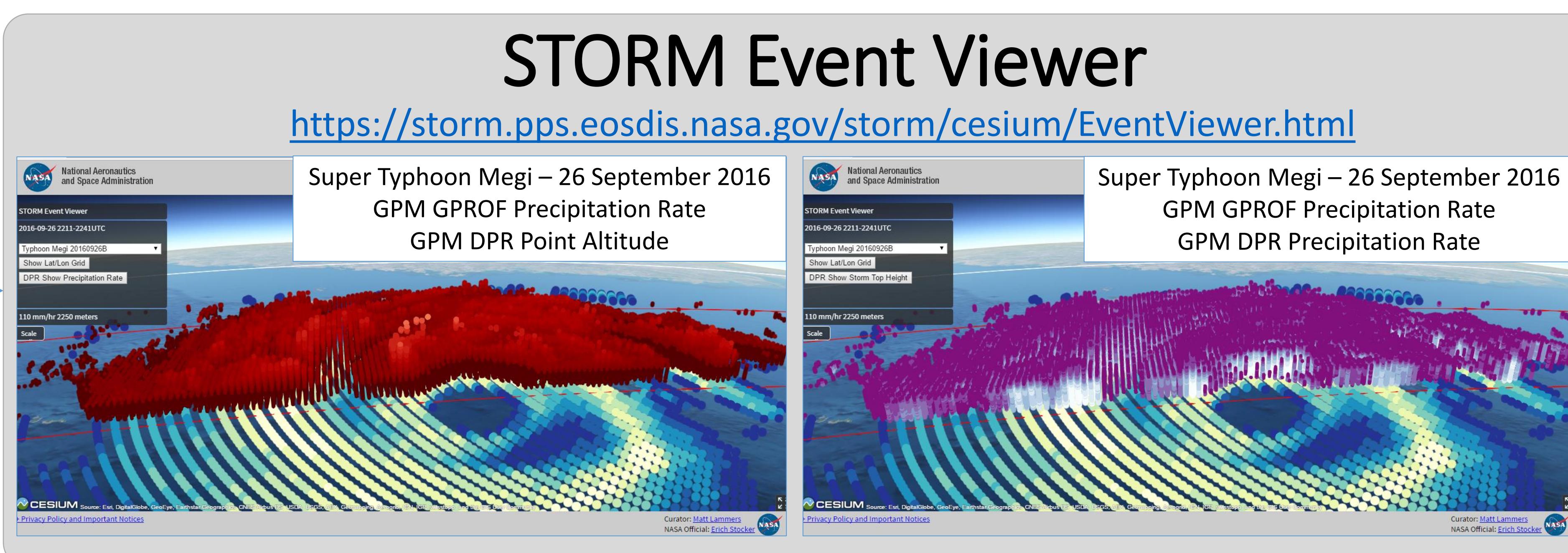
## GPM Near Real Time Viewer

<https://storm.pps.eosdis.nasa.gov/storm/cesium/GPMNRTView.html>



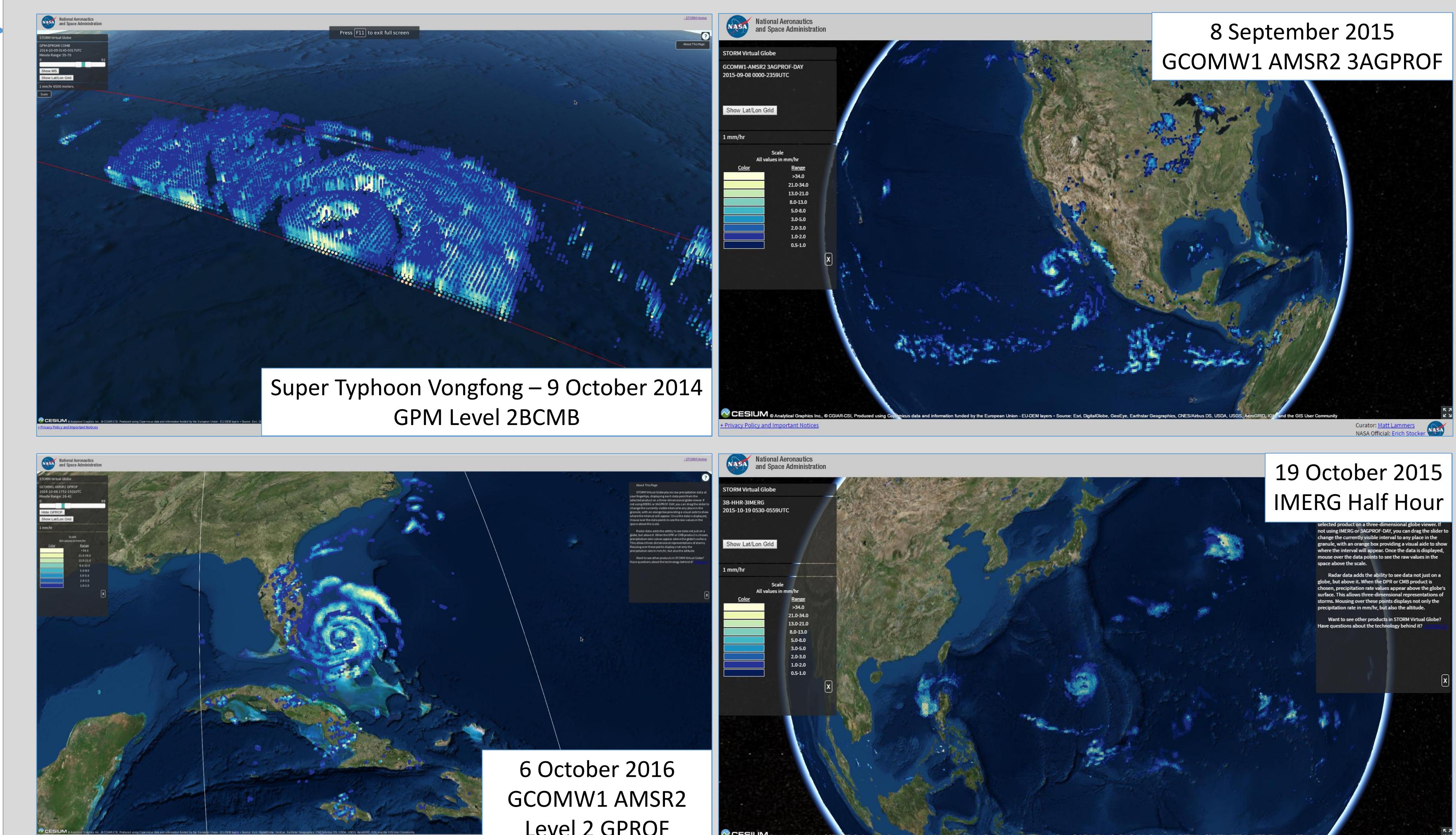
## STORM Event Viewer

<https://storm.pps.eosdis.nasa.gov/storm/cesium/EventViewer.html>



## STORM Virtual Globe

<https://storm.pps.eosdis.nasa.gov/storm/data/Service.jsp?serviceName=RestrictedOrder>



Data provided by NASA/JAXA. Imagery generated by Matt Lammers as part of the PPS group at NASA Goddard. Satellite graphic created by JAXA.  
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